SEQUENCE LISTING

Toumanen, Elaine I.	
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Ala	Thr 50	Ala	Ile	Ala	Gln	Ser 55	Leu	Glu	Gly	Lys	Asp 60	Arg	Gln	Ser	Ile
Glu 65	Gln	Val	Leu	Asp	Leu 70	Tyr	Ser	Gln	Thr	Ser 75	Asp	Ile	Lys	Gly	Thr 80
Val	Lys	Gly	Glu	Met 85	Thr	Glu	Asp	Lys	Leu 90	Glu	Val	Lys	Asp	Ser 95	Leu
Pro	Leu	Asp	Thr 100	Asp	Arg	Gln	Thr	Thr 105	Ser	Leu	Phe	Ile	Glu 110	Glu	Arg
Glu	Val	Lys 115	Thr	Gln	Asp	Gly	Gly 120	Thr	Met	Ile	Leu	Gln 125	Phe	Leu	Ala
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Ser	Lys	Asp 195	Glu	Ile	Gly	Asn	Leu 200	Lys	Glu	Gln	Ile	Asn 205	Ser	Leu	Tyr
Gln	His 210	Leu	Leu	Thr	Val	Ile 215	Ala	Asp	Leu	His	Glu 220	Lys	Asn	Glu	Ala
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His	Glu	Leu	Lys	Thr 245	Pro	Leu	Ala	Ser	Leu 250	Lys	Ile	Leu	Ile	Glu 255	Asn

Met Arg Glu Asn Ile Gly Arg Tyr Lys Asp Arg Asp Gln Tyr Leu Gly

260 265 270

Val Ala Leu Gly Ile Val Asp Glu Leu Asn His His Val Leu Gln Ile 275 280 285

Leu Ser Leu Ser Ser Val Gln Glu Leu Arg Asp Asp Arg Glu Thr Ile 290 295 300

Asp Leu Leu Gln Met Thr Gln Asn Leu Val Lys Asp Tyr Ala Leu Leu 305 310 315 320

Ala Lys Glu Arg Glu Leu Gln Ile Asp Asn Ser Leu Thr His Gln Gln 325 330 335

Ala Tyr Leu Asn Pro Ser Val Met Lys Leu Ile Leu Ser Asn Leu Ile 340 345 350

Ser Asn Ala Ile Lys His Ser Val Pro Gly Gly Leu Val Arg Ile Gly 355 360 365

Glu Arg Glu Gly Glu Leu Phe Ile Glu Asn Ser Cys Ser Ser Glu Glu 370 375 380

Gln Glu Lys Leu Ala Gln Ser Phe Ser Asp Asn Ala Ser Arg Lys Val 385 390 395 400

Lys Gly Ser Gly Met Gly Leu Phe Val Val Lys Ser Leu Leu Glu His 405 410 415

Glu Lys Leu Ala Tyr Arg Phe Glu Met Glu Glu Asn Ser Leu Thr Phe 420 425 430

Phe Ile Asp Phe Pro Lys Val Val Gln Asp 435 440

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acaggacgaa tottttotta caaggataco aaggtggact ttgaaagcta cagtgcaago 420 ctcgcaggto aagaagtgco tatcaatgco aaagagttgg aaattotgga otatotagtg 480 aaaaatgaag googggoott gactogatot cagattatog atgoogtottg gaaagcgaca 540 gatgaggtto cotttgacog tgttattgat gtttatatoa aggaattgcg gaaaaagcta 600 gacttggatt gtatootoac tgtgogcaat gttggttata aattggagog aaaatga 657

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<212> PRT

<213> bacterial

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Ser Asp Tyr Leu Thr Asp Cys Gly Tyr Glu Thr Ile Glu Ala Ala Asp 20 25 30

Gly Gln Glu Ala Leu Glu Gln Phe Ser Ser Tyr Glu Val Ala Leu Val 35 40 45

Leu Leu Asp Ile Gln Met Pro Lys Leu Asn Gly Leu Glu Val Leu Ala 50 55 60

Glu Ile Arg Lys Thr Ser Gln Val Pro Val Leu Met Leu Thr Ala Phe 65 70 75 80

Gln Asp Glu Glu Tyr Lys Met Ser Ala Phe Ala Ser Leu Ala Asp Gly 85 90 95

Tyr Leu Glu Lys Pro Phe Ser Leu Ser Leu Leu Lys Val Arg Val Asp 100 105 110

Ala Ile Phe Lys Arg Tyr Tyr Asp Thr Gly Arg Ile Phe Ser Tyr Lys 115 120 125

Asp Thr Lys Val Asp Phe Glu Ser Tyr Ser Ala Ser Leu Ala Gly Gln 130 135 140

Glu Val Pro Ile Asn Ala Lys Glu Leu Glu Ile Leu Asp Tyr Leu Val 145 150 155 160

Lys Asn Glu Gly Arg Ala Leu Thr Arg Ser Gln Ile Ile Asp Ala Val 165 170 175

Trp Lys Ala Thr Asp Glu Val Pro Phe Asp Arg Val Ile Asp Val Tyr 180 185 190 Ile Lys Glu Leu Arg Lys Lys Leu Asp Leu Asp Cys Ile Leu Thr Val 195 200 205

Arg Asn Val Gly Tyr Lys Leu Glu Arg Lys 210 215

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Ala Glu Ala Val Leu Tyr Gln Ile Asn Tyr Asn Phe Glu Pro Gly Lys
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Phe Tyr Ser Ile Ile Gly Glu Ser Gly Ala Gly Lys Ser Thr Leu Leu $35 \hspace{1cm} 40 \hspace{1cm} 45$

Ser Leu Leu Ala Gly Leu Asp Ser Pro Val Glu Gly Ser Ile Leu Phe 50 55 60

Gln Gly Glu Asp Ile Arg Lys Lys Gly Tyr Ser Tyr His Arg Met His
65 70 75 80

His Ile Ser Leu Val Phe Gln Asn Tyr Asn Leu Ile Asp Tyr Leu Ser 85 90 95 Pro Leu Glu Asn Ile Arg Leu Val Asn Lys Lys Ala Ser Lys Asn Thr
100 105 110

Leu Leu Glu Leu Gly Leu Asp Glu Ser Gln Ile Lys Arg Asn Val Leu
115 120 125

Gln Leu Ser Gly Gly Gln Gln Gln Arg Val Ala Ile Ala Arg Ser Leu 130 135 140

Val Ser Glu Ala Pro Val Ile Leu Ala Asp Glu Pro Thr Gly Asn Leu 145 150 155 160

Asp Pro Lys Thr Ala Gly Asp Ile Val Glu Leu Leu Lys Ser Leu Ala 165 170 175

Gln Lys Thr Gly Lys Cys Val Ile Val Val Thr His Ser Lys Glu Val 180 185 190

Ala Gln Ala Ser Asp Ile Thr Leu Glu Leu Lys Asp Lys Lys Leu Thr 195 200 205

Glu Thr Arg Asn Thr Ser Lys 210 215

<210> 19

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<212> DNA

<213> bacterial

<400> 19

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Gly Leu Ser Ile Lys Gly Ala Thr Ala Lys Ala Ser Gln Glu Thr Phe $35 \hspace{1cm} 40 \hspace{1cm} 45$

Lys Asn Ile Thr Asn Ser Phe Ser Met Gln Ile Asn Arg Arg Val Asn 50 55 60

Gln Gly Thr Pro Arg Gly Ala Gly Asn Ile Lys Gly Glu Asp Ile Lys
65 70 75 80

Lys Ile Thr Glu Asn Lys Ala Ile Glu Ser Tyr Val Lys Arg Ile Asn 85 90 95

Ala Ile Gly Asp Leu Thr Gly Tyr Asp Leu Ile Glu Thr Pro Glu Thr 100 105 110

Lys Lys Asn Leu Thr Ala Asp Arg Ala Lys Arg Phe Gly Ser Ser Leu 115 120 125

Met Ile Thr Gly Val Asn Asp Ser Ser Lys Glu Asp Lys Phe Val Ser 130 135 140

Gly Ser Tyr Lys Leu Val Glu Gly Glu His Leu Thr Asn Asp Asp Lys 145 150 155 160

Asp Lys Ile Leu Leu His Lys Asp Leu Ala Ala Lys His Gly Trp Lys
165 170 175

Val Gly Asp Lys Val Lys Leu Asp Ser Asn Ile Tyr Asp Ala Asp Asn

180 185 190

Glu Lys Gly Ala Lys Glu Thr Val Glu Val Thr Ile Lys Gly Leu Phe 195 200 205

- Asp Gly His Asn Lys Ser Ala Val Thr Tyr Ser Gln Glu Leu Tyr Glu 210 215 220
- Asn Thr Ala Ile Thr Asp Ile His Thr Ala Ala Lys Leu Tyr Gly Tyr 225 230 235 240
- Thr Glu Asp Thr Ala Ile Tyr Gly Asp Ala Thr Phe Phe Val Thr Ala 245 250 255
- Asp Lys Asn Leu Asp Asp Val Met Lys Glu Leu Asn Gly Ile Ser Gly 260 265 270
- Ile Asn Trp Lys Ser Tyr Thr Leu Val Lys Ser Ser Ser Asn Tyr Pro 275 280 285
- Ala Leu Glu Gln Ser Ile Ser Gly Met Tyr Lys Met Ala Asn Leu Leu 290 295 300
- Phe Trp Gly Ser Leu Ser Phe Ser Val Leu Leu Leu Ala Leu Leu Leu 305 310 315 320
- Ser Leu Trp Ile Asn Ala Arg Arg Lys Glu Val Gly Ile Leu Leu Ser 325 330 335
- Ile Gly Leu Lys Gln Ala Ser Ile Leu Gly Gln Phe Ile Thr Glu Ser 340 345 350
- Ile Leu Ile Ala Ile Pro Ala Leu Val Ser Ala Tyr Phe Leu Ala Asn 355 360 365
- Tyr Thr Ala Arg Ala Ile Gly Asn Thr Val Leu Ala Asn Val Thr Ser 370 375 380
- Gly Val Ala Lys Gln Ala Ser Lys Ala Ala Gln Ala Ser Asn Leu Gly 385 390 395 400
- Gly Gly Ala Glu Val Asp Gly Phe Ser Lys Thr Leu Ser Ser Leu Asp 405 410 415
- Ile Ser Ile Gln Thr Ser Asp Phe Ile Ile Ile Phe Val Leu Ala Leu 420 425 430
- Val Leu Val Val Leu Val Met Ala Leu Ala Ser Ser Asn Leu Leu Arg

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<212> PRT

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<400> 22

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Ser Ala Cys Leu Thr Leu Met Lys Ser Asn Lys Thr Val Glu Ser Asn

35	40	45

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Gly	Leu	Glu	Asn	Val 85	Ser	Pro	Glu	Leu	Glu 90	Thr	Val	Ala	Lys	Leu 95	Lys
Asp	Lys	Glu	Ala 100	Val	Thr	Gly	Glu	Gln 105	Ser	Val	Glu	Arg	Asp 110	Asp	Leu
Ser	Ala	Ala 115	Asp	Asn	Asn	Leu	Val 120	Ser	Leu	Thr	Ala	Leu 125	Glu	Asp	Ser
Ser	Lys 130	Asp	Val	Thr	Phe	Thr 135	Ser	Ser	Ala	Phe	Asn 140	Leu	Lys	Glu	Gly
Arg 145	His	Leu	Gln	Lys	Gly 150	Asp	Ser	Lys	Lys	Ile 155	Leu	Ile	His	Glu	Glu 160
Leu	Ala	Lys	Lys	Asn 165	Gly	Leu	Ser	Leu	His 170	Asp	Lys	Ile	Gly	Leu 175	Asp
Ala	Gly	Gln	Ser 180	Glu	Ser	Gly	Lys	Gly 185	Gln	Thr	Val	Glu	Phe 190	Glu	Ile
Ile	Gly	Ile 195	Phe	Ser	Gly	Lys	Lys 200	Gln	Glu	Lys	Phe	Thr 205	Gly	Leu	Ser
Ser	Asp 210	Phe	Ser	Glu	Asn	Gln 215	Val	Phe	Thr	Asp	Tyr 220	Glu	Ser	Ser	Gln
Thr 225	Leu	Leu	Gly	Asn	Ser 230	Glu	Ala	Gln	Val	Ser 235	Ala	Ala	Arg	Phe	Tyr 240
Val	Glu	Asn	Pro	Lys 245	Glu	Met	Asp	Gly	Leu 250	Met	Lys	Gln	Val	Glu 255	Asn
Leu	Ala	Leu	Glu 260	Asn	Gln	Gly	Tyr	Gln 265	Val	Glu	Lys	Glu	Asn 270	Lys	Ala
Phe	Glu	Gln 275	Ile _.	Lys	Asp	Ser	Val 280	Ala	Thr	Phe	Gln	Thr 285	Phe	Leu	Thr
Ile	Phe	Leu	Tyr	Gly	Met	Leu	Ile	Ala	Gly	Ala	Gly	Ala	Leu	Ile	Leu

290 295 300

Val Leu Ser Leu Trp Leu Arg Glu Arg Val Tyr Glu Val Gly Ile Leu 305 310 315 320

Leu Ala Leu Gly Lys Gly Lys Ser Ser Ile Phe Leu Gln Phe Cys Leu 325 330 335

Glu Val Val Leu Val Ser Leu Gly Ala Leu Leu Pro Ala Phe Val Ala 340 345 350

Gly Asn Ala Ile Thr Thr Tyr Leu Leu Gln Thr Leu Leu Ala Ser Gly
355 360 365

Asp Gln Ala Ser Leu Gln Asp Thr Leu Ala Lys Ala Ser Ser Leu Ser 370 375 380

Thr Ser Ile Leu Ser Phe Ala Glu Ser Tyr Val Phe Leu Val Leu Leu 385 390 395 400

Ser Cys Leu Ser Val Ala Leu Cys Phe Leu Phe Leu Phe Arg Lys Ser 405 410 415

Pro Lys Glu Ile Leu Ser Ser Ile Ser 420 425

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<212> DNA

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Gly Leu Glu Asn Val Ser Pro Glu Leu Glu Thr Val Ala Lys Leu Lys
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